WHAT IS CLAIMED IS:

1. A plasma ion implantation system comprising:

a vacuum chamber;

a plasma generator configured to generate ions in the vacuum chamber;

a sample holder inside the vacuum chamber; and

a voltage source configured to provide a bias voltage between the sample holder and the vacuum chamber to attract ions to implant in a high-k dielectric layer of a sample positioned on the sample holder.

2. The plasma ion implantation system of claim 1, wherein the ions comprise N.

3. The plasma ion implantation system of claim 1, wherein the ions comprise one of F, Si, O, Hf, Zr, Ti, Ta, Y, V, Sc, Ba, Sr, Ru, B, Al, Ga, In, Ge, C, P, As, and Sb.

4. The plasma ion implantation system of claim 1, wherein the voltage source comprises a DC voltage source.

5. The plasma ion implantation system of claim 1, wherein the voltage source comprises an AC voltage source.

6. The plasma ion implantation system of claim 1, further comprising:

a vacuum pump for providing a specified pressure in the vacuum chamber.

7. The plasma ion implantation system of claim 1, further comprising:

a gas feed system for providing a gas to the vacuum chamber from which the plasma generator generates the ions.

8. A plasma ion implantation system comprising:

a vacuum chamber;

a vacuum pump configured to set a pressure in the vacuum chamber;

a gas feed system configured to provide a gas to the vacuum chamber;

a plasma generator configured to generate ions from the gas;

a sample holder configured to hold a sample to be implanted; and

a DC voltage source configured to accelerate positive ions toward a high-k dielectric layer of the sample to implant the ions in the high-k dielectric layer.

9. The plasma ion implantation system of claim 8, wherein the DC voltage source is coupled to the sample holder and the vacuum chamber.

10. The plasma ion implantation system of claim 8, wherein the ions comprise N.

11. The plasma ion implantation system of claim 8, wherein the ions comprise one of F, Si, O, Hf, Zr, Ti, Ta, Y, V, Sc, Ba, Sr, Ru, B, Al, Ga, In, Ge, C, P, As, and Sb.

12. The plasma ion implantation system of claim 8, wherein the high-k dielectric layer comprises one of HfO_2, HfSiO, ZrO_2, ZrSiO, SiO_2, SiON, Ta_2O_5, La_2O_3, and AL_2O_3.

13. The plasma ion implantation system of claim 8, wherein the sample comprises a buffer layer proximate the high-k dielectric layer.

14. The plasma ion implantation system of claim 13, wherein the DC voltage source is configured to accelerate positive ions toward the buffer layer of the sample to implant the ions in the buffer layer.

15. The plasma ion implantation system of claim 14, wherein the buffer layer comprises one of TiN, HfN, TaN, ZrN, LaN, SiN, and TiSi.

16. A plasma ion implantation system comprising:

a vacuum chamber;

a vacuum pump configured to set a pressure in the vacuum chamber;

a gas feed system configured to provide a gas to the vacuum chamber;

a plasma generator configured to generate ions from the gas, the ions comprising one of F, Si, O, Hf, Zr, Ti, Ta, Y, V, Sc, Ba, Sr, Ru, B, Al, Ga, In, Ge, C, P, As, and Sb;

a sample holder configured to hold a sample to be implanted; and

a voltage source configured to accelerate positive ions toward a first high-k dielectric layer of the sample to implant the ions in the first high-k dielectric layer.

17. The plasma ion implantation system of claim 16, wherein the voltage source is configured to accelerate positive ions toward a second high-k dielectric layer of the sample adjacent the first high-k dielectric layer to implant the ions in the second high-k dielectric layer.

18. The plasma ion implantation system of claim 17, wherein the first high-k dielectric layer comprises one of $HfSiO_x$ and $ZrSiO_x$.

19. The plasma ion implantation system of claim 18, wherein the second high-k dielectric layer comprises one of HfO_2, $HfSiO_x$, ZrO_2, $ZrSiO_x$, SiO_2, SiON, Ta_2O_5, La_2O_3, and AL_2O_3.

20. The plasma ion implantation system of claim 19, wherein the voltage source is configured to accelerate positive ions toward a buffer layer of the sample adjacent the second high-k dielectric layer to implant the ions in the buffer layer.

21. The plasma ion implantation system of claim 20, wherein the buffer layer comprises at least one of TiN, HfN, TaN, ZrN, LaN, SiN, and TiSi.

22. The plasma ion implantation system of claim 20, wherein the buffer layer comprises a stack of layers.

23. The plasma ion implantation system of claim 21, wherein the voltage source is a DC voltage source.

24. The plasma ion implantation system of claim 21, wherein the voltage source is an AC voltage source.

25. A method of implanting ions in a sample, the method comprising:

positioning a sample comprising a high-k dielectric layer on a sample holder in a vacuum chamber;

providing a gas to the vacuum chamber;

setting a pressure in the vacuum chamber;

generating a plasma in the vacuum chamber from the gas; and

accelerating ions in the plasma toward the sample to implant the ions in the high-k dielectric layer.

26. The method of claim 25, wherein generating a plasma comprises generating a plasma comprising N ions.

27. The method of claim 25, wherein generating a plasma comprises generating a plasma comprising one of F, Si, O, Hf, Zr, Ti, Ta, Y, V, Sc, Ba, Sr, Ru, B, Al, Ga, In, Ge, C, P, As, and Sb ions.

28. The method of claim 25, wherein accelerating ions in the plasma toward the sample comprises biasing the sample with a DC voltage.

29. The method of claim 25 wherein accelerating ions in the plasma toward the sample comprises biasing the sample with an AC voltage.

30. The method of claim 25, wherein accelerating ions in the plasma toward the sample to implant the ions in the sample comprises implanting the ions having a dose within a range of $1x10^{13}$ ions/cm^2 to $1x10^{16}$ ions/cm^2.

31. The method of claim 25, wherein accelerating ions in the plasma toward the sample to implant the ions in the sample comprises accelerating the ions to have an implant energy within a range of 5eV to 10keV.